

NAVAL SEA SYSTEMS COMMAND

NAVSEA-00C4-PI-002


CLEANING DIVING SYSTEM

AIR COMPONENTS WITH NOC

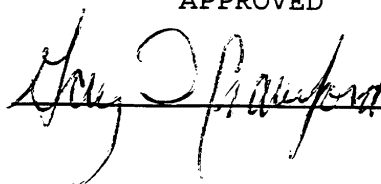
SUBMITTED

Robert Warren, NAVSEA 00C41

REVIEWED

 , NAVSEA 03Y2A

APPROVED

 , NAVSEA 00C4

DATE: 10/10/95

REVISION: —

**CLEANING DIVING SYSTEM AIR COMPONENTS**

The following NAVSEA approved procedure provides the minimum requirements for the cleaning of diving system air components with NOC (Navy Oxygen Cleaner). Locally prescribed procedures may be used if they exceed the requirements of this procedure and are approved by NAVSEA 00C. Existing DLSS cleaning procedures used by commercial vendors may be used provided these procedures have been approved by NAVSEA 00C.

**EQUIPMENT/MATERIALS**

- × **CLEANING SPACE**  
Clean office space free of debris, dust, dirt and grease and protected from wind and elements when door is opened
- × **TOOLS**  
For component removal/reinstallation and disassembling/reassembling must be clean and free of dirt, grease and debris. Tools for component disassembling/reassembling shall only be used for this purpose and kept in the cleaning space at all times.
- × **PIPE CAPPING/BAGGING MATERIAL**  
Polyethylene sheeting per MIL-B-22191, Type 1; non-shedding, non-rusting caps/blanks
- × **PROTECTIVE CLOTHING**  
Chemical resistant rubber gloves, apron and full face shield. Follow precautions on cleaning agent material safety data sheets (MSDS).
- × **SOFT NYLON BRISTLE BRUSH**
- × **FILTERED WATER**  
US Navy Grade B water is highly preferred as a cleaning agent diluent and rinse water. Water shall be filtered as needed to 25 microns. If Grade B water is not available, fresh, filtered tap water may be substituted. To lessen the potential of hard deposit formation when using tap water; minimize the cleaning cycle duration, do not reuse the cleaning solution and blow dry the cleaned and rinsed components with filtered dry oil-free nitrogen or diver's air.
- × **CLEAN RAGS**  
For external component surfaces
- × **CLEAN LINT-FREE RAGS**  
Per MIL-STD-1622
- × **ULTRAVIOLET (UV) LIGHT**  
Wavelength of 3,600 to 3,900 angstroms
- × **ULTRASONIC SINK**  
Transducer minimum power rating of 4 watts per square inch, a frequency greater than 25kHz and capable of heating solution to 180°F
- × **THERMOMETER**  
For determining temperature of cleaning solutions and rinse water
- × **WHITE SAMPLING DISH and/or CLEAR SAMPLE BOTTLE**
- × **DRYING SOURCE**  
Filtered oil-free N<sub>2</sub> or divers air; heat gun; or heated vacuum oven
- × **WHITE LIGHT SOURCE**  
Minimum 100 candle power (1256 lumens), an ordinary D-cell flashlight with xenon bulb is acceptable
- × **pH MEASURING DEVICE**  
pH paper or pH meter
- × **SILICON O-RING GREASE**  
Nontoxic silicon lubricant (such as DOW Corning Corp.'s DC4 and DC33)

**CLEANING AGENTS**

Precleaners	Temp Range	Cleaner:Water (max)
NOC	140°F-160°F	1:1
TSP	160°F-180°F	6.4 oz:1 gal
NID	120°F maximum	0.5 oz:1 gal
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Final cleaner	Temp Range	Cleaner:Water (max)
NOC	140°F-160°F	1:1

**LIST COMPONENTS TO BE CLEANED**

Below list each component by REC number, component description, component number and system drawing number.

<u>REC No.</u>	<u>Component Description</u>	<u>Component No.</u>	<u>System Dwg No.</u>
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**NOTE**

WHEN INSTALLING NEW COMPONENTS OR NEW PRESSURE BOUNDARY PARTS IN EXISTING COMPONENTS, HYDROSTATIC TESTING IS REQUIRED. HYDROSTATIC TESTING SHOULD BE ACCOMPLISHED PRIOR TO CLEANING. PRECLEANING OF NEW COMPONENTS OR NEW PARTS IS NOT REQUIRED UNLESS GREASE OR DEBRIS IS VISIBLE.

**COMPONENT REMOVAL/PRECLEANING**

This section is to be used for precleaning and removing a diving system air component.

**PROCEDURE:**

(Initial each step as completed)

1. \_\_\_\_\_ Bleed all pressure from system and tag out system as required by local instructions before commencing any work. If possible move portable systems into a clean area shielded from the wind and debris.

**WARNING**

PROTECTIVE CLOTHING INCLUDING RUBBER GLOVES, APRON AND FULL FACE SHIELD ARE REQUIRED. EXPOSURE OF SKIN, EYES AND/OR BREATHING PASSAGES TO CLEANING AGENTS CAN RESULT IN SEVERE IRRITATION AND

CHEMICAL BURNS. CONSULT VENDOR MATERIAL SAFETY DATA SHEETS (MSDS) BEFORE WORKING WITH CLEANING AGENTS.

WARNING

VERIFY THOSE CLEANING AGENTS WHICH MAY BE CLASSIFIED AS HAZARDOUS MATERIAL BY LOCAL AUTHORITIES ARE DISPOSED OF IN ACCORDANCE WITH LOCAL HAZMAT REGULATIONS.

WARNING

TSP IS INCOMPATIBLE WITH ALUMINUM AND COPPER. BOTH TSP AND NOC ARE INCOMPATIBLE WITH EPOXY COMPOUNDS.

CAUTION

WIPE UP ANY SPILLS OF TSP OR NOC IMMEDIATELY. ONCE DRIED, THE RESIDUE OF THESE AGENTS IS EXTREMELY DIFFICULT TO REMOVE.

2. \_\_\_\_\_ Preclean exterior of component to be removed and adjacent piping thoroughly using a nylon bristle brush and an approved precleaning agent, appropriately diluted with water. Ensure that the precleaner is compatible with the materials of the component being cleaned.
3. \_\_\_\_\_ Immediately rinse the component thoroughly with fresh water (need not be filtered). Do not allow precleaner solution to dry on component. Rinse water temperature should be hot (approx. 110°F) but must not exceed the maximum use temperature of the pre-cleaner. Dry component with clean rag or other drying source.

CAUTION

IF PRECLEANER IS NOT THOROUGHLY RINSED OFF, REPEATED FINAL CLEANINGS MAY BE NECESSARY RESULTING IN HIGHER PROCESS COSTS.

4. \_\_\_\_\_ If unable to move system into a clean area, per step 2, use clear polyethylene sheeting or a glove bag to form a containment around the component.
5. \_\_\_\_\_ Inspect tools for cleanliness. All tools shall be free of oil and grease. Clean hands prior to removing component.
6. \_\_\_\_\_ Loosen all connections until finger tight, then disconnect component from piping.
7. \_\_\_\_\_ Immediately attach clean blank fittings or tape a layer of clean polyethylene plastic sheeting (recommend using 2 layers) over the piping connections after component is removed.

CAUTION

DO NOT USE WOOD OR UNTHREADED PLASTIC PLUGS WHICH MAY SHED AND CONTAMINATE PIPING.

8. \_\_\_\_\_ Inspect internal surfaces of component. If contamination is visible, preclean and rinse internal surfaces in accordance with steps 2 and 3.
9. \_\_\_\_\_ Place component into clean polyethylene bag or tape clean polyethylene plastic around the components ends and move component to the cleaning space.

#### **FINAL CLEANING/REINSTALLATION**

This section is to be used for the final cleaning process and analyzing the cleanliness of a diving system air component.

10. \_\_\_\_\_ In the cleaning space, verify the ultrasonic tank has been filled with NOC solution diluted at 1:1 with water (preferably Grade B) filtered to 25 microns and brought to between 140°F-160°F. The tank should remain covered at all times to minimize evaporation of the solution.
11. \_\_\_\_\_ Obtain, in a clear bottle, a sample of the solution from the tank and inspect for possible hydrocarbon contamination before each use. Use a bright white light, held within 18 inches of sample, to examine the solution for an oil sheen or cloudiness. If contamination is suspected, replace NOC solution in tank and retest.
12. \_\_\_\_\_ Perform a shake test by vigorously shaking the sample bottle for 15 seconds. If bubbles remain on surface of sample after 5 minutes, hydrocarbons are present. If contaminated, replace NOC solution in tank and retest.

#### **NOTE**

NOC SHOULD NOT BE USED MORE THAN 5 TIMES BETWEEN SOLUTION CHANGES UNLESS A QUANTITATIVE HYDROCARBON ANALYSIS OF THE SOLUTION IS PERFORMED. IF USING TAP WATER AS A DILUENT, SOLUTION SHOULD BE CHANGED AFTER EACH USE.

13. \_\_\_\_\_ Remove component from bag or protective seals and disassemble component per manufacturers instructions. Remove all soft goods.
14. \_\_\_\_\_ Turn ultrasonic tank on and place metallic component parts in ultrasonic bath for a minimum of 5 minutes and a maximum of 10 minutes.
15. \_\_\_\_\_ Upon completion of ultrasonic bath cycle, fill a clean clear sample jar half full with cleaning solution from the tank and stopper the bottle.
16. \_\_\_\_\_ Visually inspect sample for hydrocarbon contamination with a bright white light. Inspect for the telltale sheen indicating the presence of hydrocarbons. If contamination is found, replace solution, return to step 10 and repeat final cleaning and rinsing steps until no hydrocarbons are detected.

17. \_\_\_\_\_ Perform a shake test to detect the presence of soluble hydrocarbons. Shake sample bottle vigorously for 15 seconds. If bubbles remain on surface of sample after 5 minutes, sample is contaminated. Replace solution, return to step 10 and repeat final cleaning and rinsing steps until no hydrocarbons are detected.
18. \_\_\_\_\_ Remove and thoroughly rinse component parts immediately in a batch tank, ultrasonic tank or under flowing water. Water shall be filtered and preferably U.S. Navy Grade B water. Rinse water temperature should be hot (between 110°F and 140°F).
19. \_\_\_\_\_ Test pH level of water used for final rinse to detect presence of NOC. If pH level is greater than 8, repeat step 18 and retest until pH level is below 8.
20. \_\_\_\_\_ Pour a sample of final rinse water used to rinse component into a clean white dish or a clear clean jar. Visually inspect final rinse water sample for particulates with a bright white light held within 18 inches of the sample. If contamination is found, return to step 18 and repeat final rinsing steps until no particulates are visible in the rinse water sample.
21. \_\_\_\_\_ Dry component with clean lint-free rag, filtered divers air, filtered N<sub>2</sub>, heated vacuum oven or heat gun.
22. \_\_\_\_\_ Visually inspect all internal surfaces of component for hydrocarbon contamination with a bright white light. Inspect for the telltale sheen indicating the presence of hydrocarbons. If contamination is found return to step 10 and repeat final cleaning and rinsing steps until no hydrocarbons are detected.
23. \_\_\_\_\_ Visually inspect all internal surfaces of component for hydrocarbon contamination with a UV light. Inspect for fluorescence indicating the presence of hydrocarbons. If contamination is found return to step 10 and repeat cleaning steps until no hydrocarbons are detected.
24. \_\_\_\_\_ If possible, replace all used soft goods. Soak soft goods in a jar of NID solution for 1-2 minutes, then agitate by shaking the jar for 15-30 seconds. If any residual contaminants remain, clean all surfaces of soft goods with a lint-free rag saturated with NID solution. Care must be used not to distort or damage delicate soft goods such as valve seats. If new soft goods are not available, undamaged used soft goods may be used and must also be cleaned in this manner. Document all new soft goods used in the REC.
25. \_\_\_\_\_ Immediately and thoroughly rinse soft goods with warm filtered water. Obtain sample of water used to rinse soft goods in clean sample bottle. Stopper bottle and perform shake test, shaking sample bottle vigorously for 15 seconds. If bubbles remain on surface of sample after 5 minutes, NID is still present. Repeat rinsing and shake test until all traces of NID are removed.

26. \_\_\_\_\_ Dry soft goods with filtered divers air, filtered N<sub>2</sub> or lint free-rag. Apply very thin coating of silicon grease to o-rings and other software where required.
27. \_\_\_\_\_ Reassemble component and place it into a clean polyethylene bag or tape clean polyethylene plastic around component ends.
28. \_\_\_\_\_ Bring component back to system. Remove bag or seals from component and caps or seals from system piping connections and reinstall component using clean tools.

**NOTE**

AFTER COMPLETION OF CLEANING, SEAT TIGHTNESS AND/OR JOINT TIGHTNESS TESTING IS REQUIRED.

**PROCEDURE SIGN-OFF:** Each person performing this procedure shall complete the below sign-off.

_____ Technician's Name (Print)	_____ Initials	_____ Technician's Signature	_____ Date
_____ Technician's Name (Print)	_____ Initials	_____ Technician's Signature	_____ Date
_____ Technician's Name (Print)	_____ Initials	_____ Technician's Signature	_____ Date